DOCUMENT RESUME

ED 444 466 IR 020 121

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TITLE A Farewell to the Traditional Instructional Media and Technologies in the New Millennium.
PUB DATE 2000-00-00
NOTE 7p.; In: Society for Information Technology & Teacher Education International Conference: Proceedings of SITE 2000 (11th, San Diego, California, February 8-12, 2000). Volumes 1-3; see IR 020 112.
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Comparative Analysis; *Curriculum Development; *Educational Technology; Higher Education; *Information Technology; Instructional Design; Instructional Development; *Teacher Education
IDENTIFIERS *Technology Integration

ABSTRACT

This paper reviews the traditional instructional media and technologies offered in teacher training programs in the past and in some of the programs today--primarily presentation media and technologies, such as audio/video systems, overhead, slide, filmstrip, and opaque projections, and multimedia kits. New technologies in digital information storage, access and retrieval, delivery, presentation, and electronic communications as related to instruction are examined, discussed, and compared to the traditional instructional media and technology. Approaches to integrating new technology into teacher training curricula and programs is also discussed. (Author/MES)

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ED 444 466

A Farewell to the Traditional Instructional Media And Technologies in the New Millennium

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Abstract: This paper will review the traditional instructional media and technologies offered in teacher training programs in the past and in some of the programs today, primarily presentation media and technologies, such as audio/video systems, overhead, slide, filmstrip, and opaque projections, and multimedia kits. New technologies in digital information storage, access and retrieval, delivery, presentation, and electronic communications as related to instruction will be examined, discussed, and compared to the traditional instructional media and technologies. Approaches to integrating new technologies into teacher training curricula and programs will also be discussed.

Introduction

Lozano (1997) depicts a vivid picture of a classroom, where traditional media and instructional technology is used, "... the cumbersome and noisy opaque projector, of armloads of slide carrousels, tape players, and handouts resting on purple-stained fingers for trying to mimeograph that elusive image, only to arrive at a new classroom in which the security, on at all times, shone just over the projection screen." Lozano is not exaggerating. This is still the picture in some classrooms or instructional environment today. Some instructors are still using such instructional technologies like films, slides, analog video and audio, overhead projectors, and so on (Lozano, 1997). Not surprisingly, some educational technology programs for pre-service and in-service teachers still have these traditional instructional technologies on their curriculum list.

Instructional media and technologies vary widely in forms and uses. According to Teague, et al. (1994) and Heinich, et al. (1999), traditional instructional media and technology involves overhead transparencies, opaque projections, multimedia kits, 35mm filmstrips, photographic slides, motion picture films, audio recordings, video recordings, display media (chalkboard, pegboards, bulletin boards, posters, etc.), and object media (objects, models, mock-ups). Overhead transparency is displayed via overhead projector. It has been one of the most commonly used tools for presentations in the classroom. Opaque projector is used to present information in a similar way an overhead projector does, but it does not project transparencies. Instead, it presents images of printed materials or real objects. The advantages of using overhead transparency and opaque projection are that one can point to or block out part of what is being shown. On a transparency, one can also add drawings or marks while displaying information. With multimedia kits, one can display several types of media at the same time, such as books, drawings, maps, video recordings, etc. With 35mm filmstrips, one can present still or animated images with a filmstrip projector. A filmstrip can normally hold 25 to 60 frames of images. Photographic slides are made from film slides, but processed by being mounted in 2x2" frames so that images can be displayed via slide projectors. Motion picture films are more vivid when they are presented in the classroom. However, the presentation

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requires a 16mm film projector. Traditional audio and video recordings use magnetic tapes to record audio or video information. An audiocassette recorder/player is needed to record and playback audio content. For video, a video camera is required for shooting videos and a videocassette recorder/player and a monitor are needed for playing back the video. Today, most classrooms are equipped with a TV set and VHS VCR for video display. To edit these analog audio or video is a very tedious and time-consuming job, and additionally, professionals and professional equipment are needed for creating high-quality video materials. Display media usually refers to those non-projected visuals, which have been used in instruction for a long time, such as the chalkboard and multipurpose board.

Typically the instructional media and technologies used in schools reflect the curricula of our pre-service and in-service teacher training programs. Teacher training programs determine, to some extend, the diffusion and effective use of new technologies in schools because the trained teachers use the technologies that they were trained with back in their schools. In this sense, the technology that schools will use in the future rely much on the curricula we provide in the teacher training programs today. By examining curricula and textbook contents in some teacher training programs in instructional technology or educational technology, the above mentioned traditional media and technologies are still being taught as major instructional technologies. "Audio Visual Materials," "Print & Non-print Materials," "Television," "Film," etc. are frequently seen in teacher training curricula. Looking at schools, it is not difficult to find that teachers are still depending heavily on the traditional media and technologies listed above.

According to Villamil-Casanova and Molina (1997), we are now living in an information age. In this information age, computer-based multimedia technology has become a major tool for communicators and an effective catalyst for change in all disciplines. Not only has computer technology led to changes in our living environment, but it has also generated changes in our learning environment. Increasingly advanced computer and communication technologies are having an enormous impact on the ways in which educational materials are created, stored, acquired, and delivered to the learners (Barker, 1998). At this juncture, it is the time to create curricular materials to train a new generation of multimedia-assisted communicators (Villamil-Casanova & Molina, 1997). Several "change agents" identified by Barker (1999) are bringing about changes in many academic institutions, and they have served as a catalyst in the change of instructional media and technology. These "change agents" are ease of educational material creation, ease of information storage, ease of access to and retrieval of information, ease of fast and global information sharing, ease of electronic communication, and ease of information presentation and display.

Ease of Educational Material Creation

Traditionally, a variety of appropriate facilities, equipment, techniques, and materials are required to create desired educational materials. Transparencies have to be made and overhead projectors have to be used in order to present information to a larger audience such as in a classroom. Rolls of films have to be consumed in order to create filmstrips. No doubt, special techniques are required to shoot the filmstrips and have them developed before they can be projected with a filmstrip projector. Photographic slides have to be framed in order to be projected on a slide projector. To make photographic slides, one has to use cameras to shoot the images, and techniques to operate the camera, develop the film, and mount the slides are required. To create bulletin boards, letter-cutting device and coloring tools are needed. To create drawings, charts, graphs, posters and the like, various tools and techniques are required. In order to produce high quality sound or video materials, much more sophisticated facilities, equipment, and materials are required, and well-trained professionals are needed, which makes educational material creation very expensive and difficult.

Today, however, all the above-mentioned educational materials can be created with a single tool--computer, though some peripherals and extra compatible equipment are required depending on necessity. Software packages, such as *Microsoft Office* and *ClarisWorks* can be used easily to create charts, graphics, and drawings. Electronic bulletin boards can be created with computer and put onto the network or Internet. Digital camera or scanner can be used to capture digital images. Then using computer, we can create slide shows. Computer sound card and compatible software, such as *Sound Forge* or *Wave Studio* (for PC), or *Sound Edit* (for Macintosh) can be used to produce digital sound or music materials. For video material creation, analog video can be digitized using video capture boards, such as *Targa 2000*, *AV Master*, *Video Blaster*, *MiroVideo DC30 Plus*, etc. The captured digital video can also be edited with such non-linear video editing software as *Avid Xpress*, *Media 100*, *Final Cut Pro* (Macintosh only), *Premiere*, *Speed Razor*, *Trinity*,

just to name a few. More recently, a standardized digital video interface called FireWire interface (IEEE 1394) provides direct connection between a computer and a digital video camera, such as *Canon GL-1*, which has made digital video creation and editing much easier and time-saving than before.

Ease of Information Storage

Computing technology has made information storage much easier than ever before. Without computer, documents are stored primarily in printed materials. Books, magazines, newspapers are the major media for delivering stored information. Information in other formats, such as sound and video, is stored in audiocassette tapes and videotapes. To save documents, students have to either write them down in a notebook or type them out with a typewriter, or make photocopies. For audio and video, students have to have audiocassette recorder/player to store information on audiocassette tapes and VCRs to store video information. With a computer, however, one can digitize information and save it to a single storage device--the hard drive, or on a floppy disc, removable drive, or optical device with simple button clicks. Furthermore, digitized information can also be saved onto networked servers. This technology brought about the success of information sharing on the Internet. To say it is easier on storing information, not only because of saving data by simply selecting Save function from the menu bar on the, but also due to the ease of making corrections of the stored information. For traditional printed media, it is almost impossible for the writer or reader to make any changes to the original material without repeating the entire creation procedures. While in the process of writing or typing, making changes is no less a hassle practice than that on printed media, let alone making changes in the recorded audio or video information. But information stored in a computer, regardless of its format, can be modified at any time, except when the file is created read-only or burned on to a CD-ROM.

Easy of Access to and Retrieval of Information

The primary way of accessing information before this computer era was to go to a library, search the card catalog, and check out whatever was needed. The real labor was not going to the library itself and check out materials, but the tedious job of going through all the card catalog to find where the information is. The same is true with finding audio and video materials. Whereas with today's networked computers or online computers, one can easily log into a library's database to search for information regardless of the format. For some people, they can do it even without going out of their office or home. Today's Internet, especially the World Wide Web, has become almost an open library, providing information in all formats, text, graphics, images, animations, audio, and video. Many classroom teachers begin to use networked computers to access information for their students during class time. Moreover, teacher-created web pages are on the rise. These teachers put their teaching materials onto the network and/or their own web pages to allow students to access course syllabi, instructions, assignments, test materials, and the results of evaluations directly from computers at school or home. Location is no longer a boundary for accessing information. At home, one can use dialup feature to get onto the Internet through a modem. On campus, students are provided with Internet access from either computer labs or dorms. Even when traveling, one can search information on the Internet by using laptop computers that have Internet access capability. Card catalog system, though simple and inexpensive, but slow and time consuming, has given its position to the fast computer-based automated cataloging system in almost all the libraries in the United States.

Ease of Fast and Global Information Sharing

Because of the ease of creating digital media and material and the ease of storing, accessing, and retrieving information, information is now shared unprecedentedly faster and around the global. Traditionally, information is shared through local public media, such as newspaper, magazine, radio, television and even books. All these take certain time, material, and manpower for creation and then are delivered to the readers or viewers through complicated distribution channels. Educational materials are shared in the same manner. The disadvantages of traditional information sharing is the time delay between

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the transformation of information into certain format, such as printed books or magazines, and the information receiver; the duplication of information resource, material, and manpower; and the high cost of distribution. A book on science would take normally over a year before it could reach its readers. A piece of information resource has to be duplicated into numerous copies in order to meet multiple users' demands. Large quantity of materials is consumed for distributing one single information resource when copies of the resource are duplicated, such as book copies or video copies. Meanwhile, matching manpower has to be involved in the duplication and distribution of the duplicated copies. However, information technology has changed fundamentally how information is shared.

Today's information sharing is moving toward on-line formality. Information is stored digitally and put into either local network for local sharing or onto the Internet for global sharing. To share information on-line, there is only minimum information resource duplication since the resource, once on-line, can be accessed without time and place restriction (unless the resource is purposely controlled in that way). Since resource duplication is minimized, materials and manpower required for the resource duplication is reduced to the minimum, too. Books, magazines, newspapers, audio and video materials have all been witnessed on the Web today. For example, a book can be saved as PDF (portable document format) file and put onto the Web. With Acrobat Reader software, one can either read it or print it out easily, or download it to the local drive and read or print it later on. Only one resource and one distribution channel, the Web, needs to be used, and it can be accessed twenty-four hours a day, seven days a week. Sharing multimedia information on the Web has become a trend, challenging the superiority of CD-ROM, one of the major media devices for multimedia distribution today.

Sharing information on-line is also changing the way we teach in schools, where computers are in use and wired to the Internet. The traditional one classroom with one TV/VCR environment is being replaced with one-computer or multiple computers plus Internet environment. Teachers therefore can share global information with students in their classrooms. They can create their own web pages easily with web authoring tools such as *Learning Space*, *TopClass*, *Quest Net Plus*, and the like, and have their web resources shared not only with their own students, but with other students and colleagues in the world.

Ease of Electronic Communication

Electronic communication has been in use for decades, but never before has it been so popular and easy to use as today, due to the availability of computers and the Internet. E-mail, used by millions of people, has become a daily activity for most of us. In recent years, voice mail, video email, and desktop video conferencing have gained popularity. Microsoft's *Net Meeting* is being used by millions of people around the world for on-line video communication. PC-to-PC calls, particularly PC-to-Phone calls such as *MediaRing Talk* and *DialPad*, are attaining prevalence. Without exception, the ease of electronic communication is affecting classroom instruction greatly. Distance education is the area where a revolution has been witnessed. "Correspondence course" and educational TV are no longer representing distance education. Instead, in its place arise communications technologies. E-mail and webboard are used to offer on-line courses. World Wide Web is employed to offer web-based courses. Two-way interactive video network, which involves computers, compressed video technology, telephone lines, and television technology, is taking the lead in distance education to deliver live courses over a great distance. A recent study found that 58% of two-year and 62% of four-year public colleges offer such kind of distance education courses (Hodgson, 1999). Furthermore, virtual universities (Barker, 1999), which hold no campuses, have been set up to offer complete degree courses on-line.

Ease of Information Presentation and Display

Traditionally, in the classroom, information is displayed by using chalkboards, multipurpose boards, pegboards, bulletin boards, or flip charts (Heinich, 1999). They are teachers' basic instructional tools. Though simple to use, instructors have to manually write things on and erase them off every time when they use chalkboards or multipurpose boards. Writing and erasing on these boards in the classroom consume plenty of valuable instruction time. To project instructional materials in the classroom, overhead projectors,

slide projectors, and the like have to be used. To display video information, TVs and VCRs have to be available.

Information technology has brought tremendous impact on classroom presentation and display today. Computers can be used to create teaching notes for classroom presentations. *PowerPoint* has been a favor of teachers and students for classroom presentations. With *PowerPoint*, presentations can be made and modified shortly before the actual presentation. The advantage of using this software for presentation also lies in its ability to incorporate images, graphics, charts, animations, even sound and video. Presentations can be saved digitally and reused at any time later on. No more tedious and labored work on preparing presentations with traditional presentation tools! No more chalk dust or the labor of writing and erasing on boards because all these jobs can be done on a computer! Another advantage of using digitized presentation is that if the presentation is saved on the network server the instructor can pull up the files and make presentations with computers in other classrooms or at other locations as long as these computers are on the same network. Or the digitized presentations can be put onto the Web and displayed with web browsers.

Of course, a projector is needed if the computer presentation is to be projected. A LCD projector such as *Infocus*, *Proxima*, and *3M* will do the job. Since images, graphics, charts, animations, sound, and video are all digitized and/or incorporated into computer software, LCD projector can project them without involving other equipment. A LCD projector is relatively expensive at this time, but it will be commonplace as we move into the new millenium since the cost is falling.

Image display has taken dramatic change from the traditional instructional technology to today's advanced computer technology. Filmstrip technology has already become an antique. Slide projectors and overhead projectors are being replaced with digital projectors. Opaque projectors have given their positions to visual presenters like *Elmo* (also called document camera). Scanner is now used to digitize film-based images. Digital camera eliminates film by digitizing images on a chip, like *Kodak DC* series or Sony's *Mavica*, which captures images directly to a floppy disk. Using software like *Photoshop*, the digitized image can be edited and incorporated into various kinds of applications for display, which are almost impossible for traditional printouts.

Traditional video display has been relying on TV and VCR. Analog video creation is expensive and complicated. Editing analog video is more expensive and complicated. It requires high-end facilities, very expensive equipment, and well-trained professionals to complete the job. Laser disc has been accompanying TV and VCR in the display for some years. The size of the laser disc is huge, and it can only hold about 30 minutes of video on one side. However, today's video creation and editing is no longer as it was in analog video, thanks to the digital technology. Digital video, as mentioned earlier, can be captured using digital video camera and transferred to computer easily by using standardized interface. Non-linear digital video editing has completely changed video editing system. After the video clip is digitized, all needed for editing is the computer and compatible software. Video clips can be cut and expended to the specific frame. Video effects can be superimposed with almost unlimited layers. Sound can be added and edited with simple clicks, drags, and drops. Tools for shooting video footage are turning into digital, too. New DV video cameras or camcorders can capture video in digital format directly on the videotape. The cost for a DV video camera has dropped drastically. Couple of years ago, a high quality DV video camera would cost between $10,000 and $20,000. Today, a Canon GL1, with the same high quality, is only around $2,000. This DV video camera has a LCD color-viewing window, and it can serve as a viewing monitor for editing. This new digital video technology makes video capturing and editing at an affordable level, even for home entertainment.

While video turns digital, presenting video on the Web is challenging for new technologies. Video files are usually very large, making it much difficult to be played back on the Web. Nevertheless, new technology has made it possible with relatively lesser problems. To solve the playback problem on the Web, video compression is used. The technology is also called streaming video. The three major web video players on today's market are Apple's *QuickTime*, Microsoft's *Window Media Player*, and RealNetwork's *RealPlayer*.

Curriculum Issue

Giving money to schools or purchasing new technology for schools is a way to insure that schools get the new technology, but it is not an effective way for integrating technology into instruction. Over the past decade, school districts have spent billions of dollars on classroom technology, yet the classroom has changed little (Yao, et al., 1999). One of the major problems that schools are encountering is the lack of

trained teachers who know how to use and diffuse the new technology. To solve this problem and help schools use new technologies, especially the new instructional media and technologies, we need to shift the training focus into the renovation of the curriculum for pre-service and in-service teacher education programs. Graduates from a teacher training program should be the leader in using and diffusing new technology in schools, but they can not take up this responsibility if they are not trained with new technology while they are in the teacher training program.

Experience tells us that appropriate curriculum change can make a big difference. Curricula designed for technology should follow the current technology trend. Courses designed for technology should follow a sequence, which introduce technology in an adaptive and logical manner and introduce current technology that are appropriate for schools. Some teacher training programs have only introductory courses on computer literacy, which focus on basic computer applications, such as word processor, spreadsheets, database, and so on, but do not have introductory course on instructional media and technology. Some may have courses on instructional technology, but those courses still hang on to the traditional technologies. This problem needs to be addressed. In addition to introductory courses on computer applications, a course, which introduces current instructional technology, should be arranged for new students in the program. Also introductory courses on instructional design, human computer interaction, and learning theories should be offered. Based on these courses, other courses offering digital audio and video, web design, multimedia production, and courses of such nature should follow. This kind of design for teacher training program can help ensure that students trained in this program will have the knowledge and techniques on using and diffusing the current instructional technology.

Conclusion

It is apparent that computer-based instructional media and technology has far more greater advantages over traditional media and instructional technology in almost all the aspects: Educational material creation, information storage, information access and retrieval, information delivery, and information presentation. Moreover, the industry is switching from the traditional technology towards the new digital media and technology. As digital media and technology advance in the new millennium, some of the traditional instructional media and technologies will remain in use, most of them will give way to the digital world. It is the time when we can say a farewell to the traditional media and technology as we walk into the new millennium.

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